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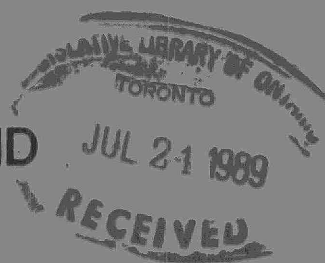
SNOW SAMPLING AND

DUSTFALL SURVEY

IN THE VICINITY OF

PROBOARD LTD., ATIKOKAN

FEBRUARY, 1988



JUNE 1989



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SNOW SAMPLING AND DUSTFALL SURVEY
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TECHNICAL SUPPORT SECTION
NORTHWESTERN REGION

JUNE 1989



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INTRODUCTION

In response to complaints of fallout of wood fines around a particleboard plant owned by Proboard Ltd. of Atikokan (formerly Pluswood Manufacturing Limited), the Ministry of the Environment carried out snow sampling studies in 1981 and 1983. The 1981 survey revealed significantly elevated levels of carbons, suspended solids and tannins near the plant and in a residential area to the east.¹ In 1983, there was a significant decrease in the fallout of contaminants from 1981.² This decrease was attributed to modifications in plant process equipment which resulted in decreased emissions of particulate matter.

In 1984, further improvements were made in emission controls when a multi-clone was added to remove particulate matter. Unfortunately, this system became unusable in 1986 and has since been bypassed. To document current levels of particulate fallout, a third snow sampling study was undertaken in February, 1988. In addition, a dustfall monitoring network was established in the fall of 1987.

METHODS

Single samples of snow were collected on February 11, 1988 from 11 sites near Proboard (Figure 1) and from two control stations remote from the study area. Core samples of the complete snow profile were obtained using standard Ministry sampling procedures.³ Snow meltwater samples were submitted to the Ministry's Thunder Bay and Toronto laboratories for analysis of carbon (total particulate carbon, dissolved inorganic carbon, and dissolved organic carbon), tannins, solids (dissolved solids, suspended solids and total solids), conductivity and pH.

The location of the dustfall monitoring stations established in October, 1987 are shown in Figure 2. Open top containers (dustfall jars) were exposed for 30 day periods to collect fallout of particulate matter that settled out from the atmosphere by gravity.

RESULTS AND DISCUSSION

Results from the 1988 snow sampling survey are summarized in Table 1, together with data from 1981 and 1983. In 1988, concentrations of particulate carbon and suspended solids slightly exceeded contaminant guidelines at off-property sites near Proboard. These levels, however, were much lower than those in 1981 and slightly lower than values recorded in 1983. Highest concentrations of solids and particulate carbon occurred at sites 3, 4 and 6, on company property.

For unknown reasons, snow meltwater pH was higher in 1988 than that in the earlier surveys. Conductivity levels were highest at the sites on company property, but even here were below the contaminant guideline. At most sites, tannins showed a significant drop from 1981 and 1983 levels.

The deposition rates of particulate carbons in snow were calculated. According to data from the Atikokan weather station, snow was on the ground for 85 days prior to the 1988 snow sampling dates. The comparable periods for the 1983 and 1981 surveys were 56 days and 67 days, respectively. Deposition rates of particulate carbon and solids are summarized in Table 2. These data show that the off-property fallout levels ($\text{g/m}^2/30$ days) were well below the maximum acceptable limit of $7 \text{ g/m}^2/30$ days allowed in Ontario. Figures 3a to 3c illustrate the decrease in deposition of particulate carbon over the three study periods.

Correlation matrices between selected parameters and distance from Proboard are presented in Table 3. The strong positive relationship between particulate carbon, solids, conductivity and pH suggests that these parameters are associated with a common source. The strong negative relationship between these parameters and distance from Proboard implicates the particle board plant as the emission source.

Dustfall levels, reported in Table 4, did not exceed the monthly provincial objective ($7 \text{ g/m}^2/30 \text{ days}$) at any site. These findings agree with the deposition rates estimated from the snow sampling survey. No complaints of particulate fallout have been received in recent years from area residents.

CONCLUSIONS AND RECOMMENDATIONS

A snow sampling survey was carried out near Proboard's particle board plant in 1988. It revealed a slight decrease in the fallout of particulate matter from 1983 and a large decrease from 1981. Significantly elevated fallout in 1988 was confined to company property. Dustfall consistently met the provincial objective off company property. Planned replacement of the malfunctioning multi-clone system at Proboard should further reduce airborne discharges.

Air quality studies to date do not indicate a cause for concern about particulate fallout off company property around Proboard Ltd. Dustfall monitoring will continue at least to the end of 1988, but no further snow sampling appears warranted at this time.

REFERENCES

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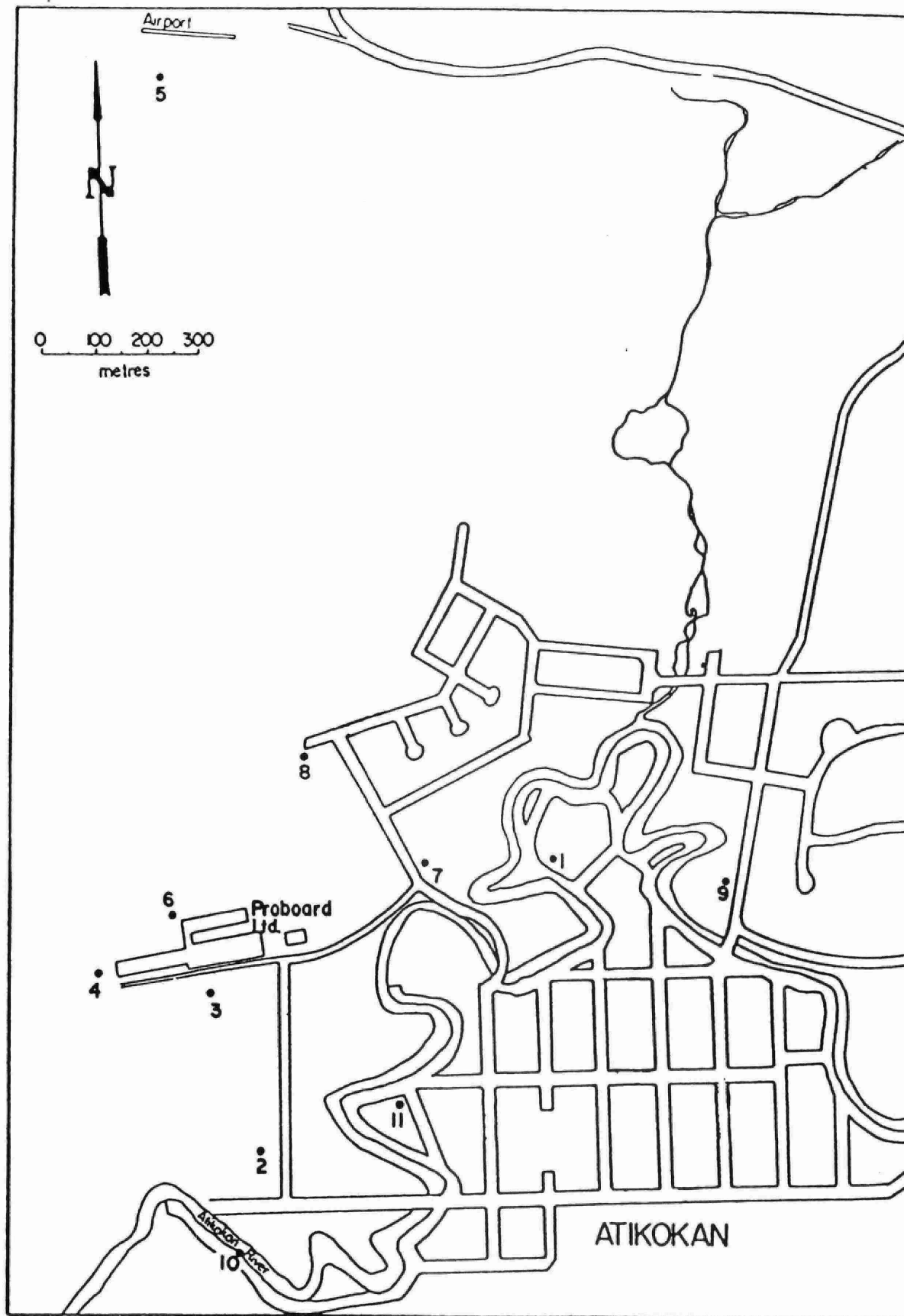


Figure 1. Snow sampling sites, Atikokan, 1988.

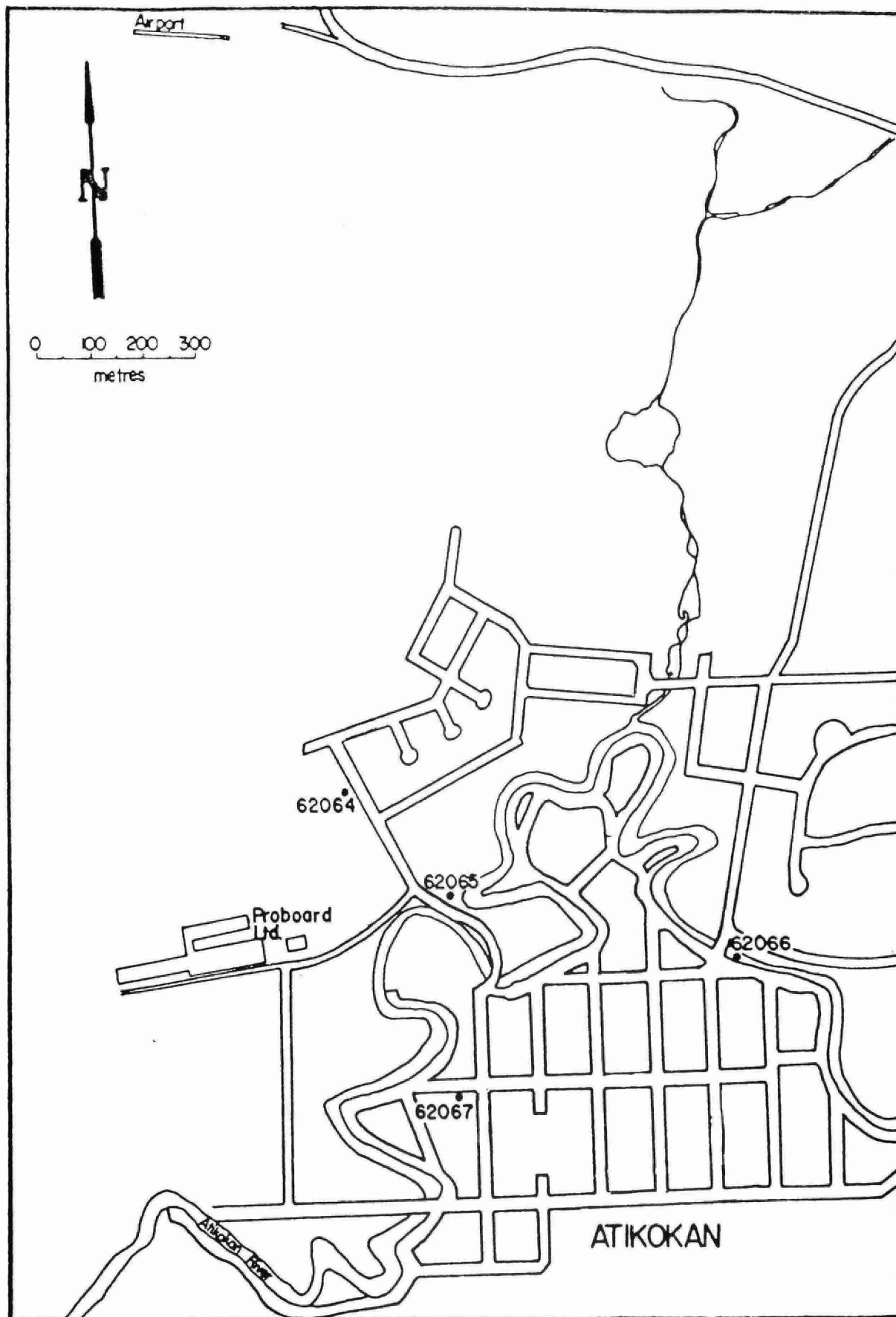


Figure 2. Dustfall monitoring sites, Atikokan, 1988.

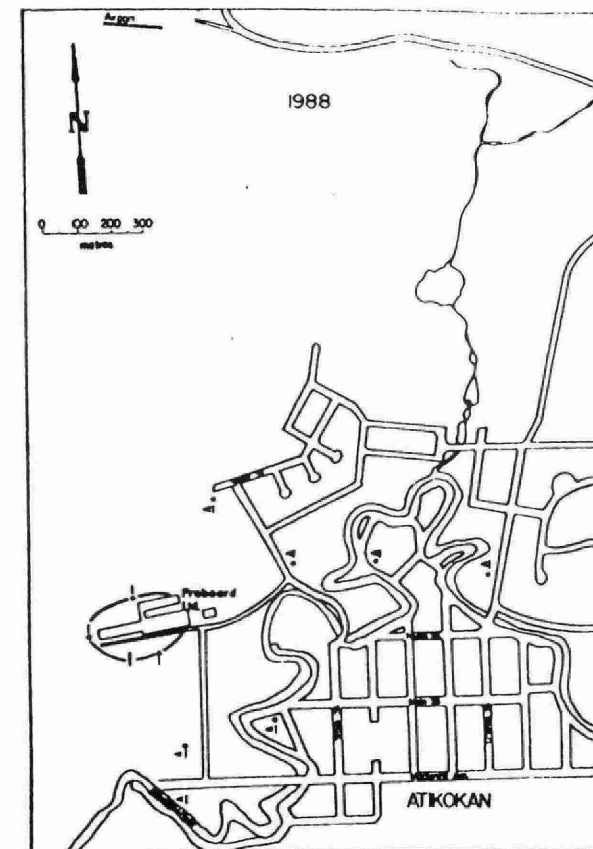
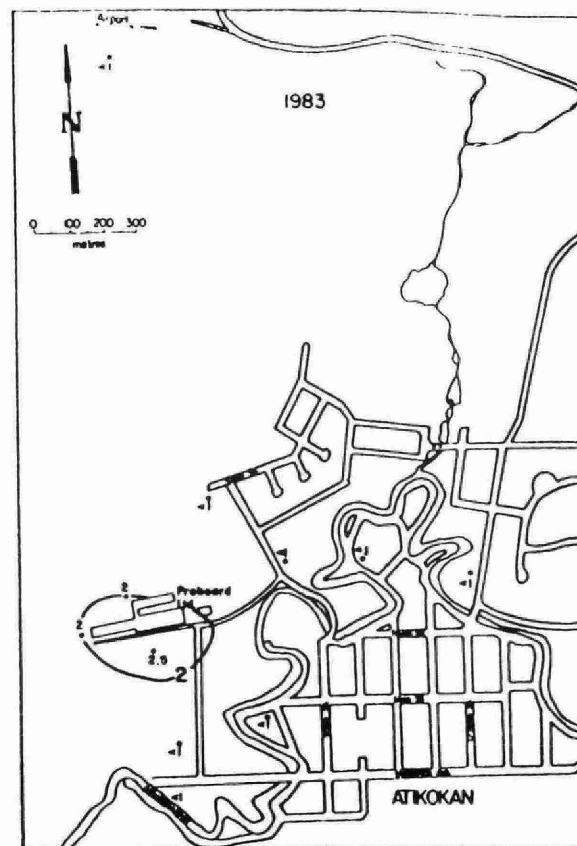
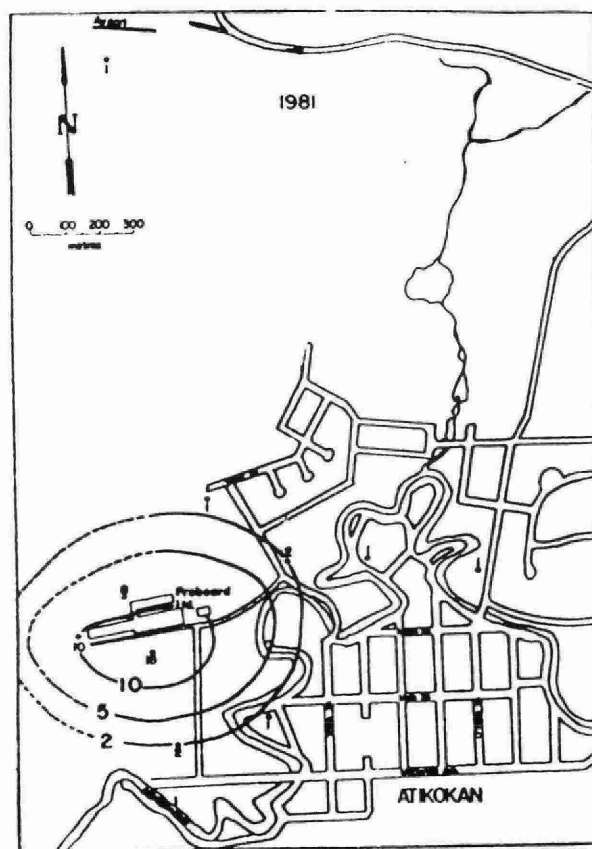


Figure 3. Deposition levels of total particulate carbon ($\text{g/m}^2/30$ days) in snow near Proboard Ltd., Atikokan, 1981, 1983 and 1988.

TABLE 1. Comparison between levels of particulate carbon, solids and tannins (all in mg/l), conductivity (umhos/cm), and pH in meltwater from snow collected near Proboard Ltd., Atikokan, in 1981, 1983 and 1988.

Site	Particulate carbon			Solids					Tannins			Cond. ^d	pH		
				RSP ^a			RSF ^b	RST ^c							
	1981	1983	1988	1981	1983	1988	1988	1988	1981	1983	1988	1988	1981	1983	1988
1	<u>46^e</u>	<u>13</u>	<u>10</u>	<u>90</u>	23	<u>35</u>	<u>35</u>	<u>70</u>	2	1	0	31	4.8	5.1	8.2
2	<u>36</u>	<u>18</u>	<u>10</u>	<u>75</u>	<u>46</u>	<u>30</u>	10	40	2	2	0	15	4.5	4.3	6.9
3 ^f	<u>610</u>	<u>110</u>	<u>60</u>	<u>750</u>	<u>210</u>	<u>180</u>	<u>90</u>	<u>270</u>	5	5	1	43	4.6	4.4	9.3
4 ^f	<u>290</u>	<u>92</u>	<u>68</u>	<u>410</u>	<u>170</u>	<u>160</u>	<u>90</u>	<u>250</u>	3	4	1	34	4.6	4.7	8.8
5	5	7		20	22	10	10	20	0	0	0	11	4.6	8.2	6.5
6 ^f	<u>320</u>	<u>94</u>	<u>88</u>	<u>490</u>	<u>190</u>	<u>260</u>	<u>280</u>	<u>540</u>	3	3	3	40	4.8	4.5	9.2
7	<u>68</u>	4	<u>16</u>	<u>130</u>	14	<u>85</u>	<u>75</u>	<u>160</u>	2	0	0	44	5.1	4.9	9.3
8	<u>40</u>	<u>15</u>	<u>9</u>	<u>75</u>	<u>33</u>	<u>30</u>	20	<u>50</u>	2	1	0	21	4.4	4.3	7.2
9	<u>31</u>	<u>9</u>	6	<u>75</u>	24	<u>30</u>	5	35	1	1	0	25	4.6	6.0	7.3
10	<u>21</u>	4	4	<u>40</u>	11	15	20	35	1	0	0	13	4.7	4.4	6.4
11	<u>36</u>	7	<u>10</u>	<u>65</u>	16	<u>30</u>	<u>45</u>	<u>75</u>	1	<1	0	20	4.7	4.4	7.0
Controls	2	<1	<1	10	2	3	7	10	0	0	0	11	4.7	4.3	4.6
Guidelines		7			25		30	40		-		45		-	

^aRSP = suspended solids

^bRSF = dissolved solids

^cRST = total solids

^dCond. = conductivity

^eValues exceeding contaminant guidelines are underlined.

^fSites on company property

TABLE 2. Comparison between deposition levels of particulate carbon and solids ($\text{g}/\text{m}^2/30$ days) in snow collected near Proboard Ltd., Atikokan, in 1981, 1983 and 1988.

Site	Particulate carbon			Suspended solids			Total solids
	1981	1983	1988	1981	1983	1988	1988
1	1.3	0.3	0.1	2.6	0.5	0.4	0.9
2	1.6	0.3	0.1	3.3	0.7	0.4	0.5
3 ^a	<u>15.0^b</u>	2.5	0.9	<u>18.3</u>	4.8	2.6	3.9
4 ^a	<u>9.9</u>	2.0	1.0	<u>13.5</u>	3.6	2.4	3.8
5	0.2	0.2		0.8	0.5	0.1	0.2
6 ^a	<u>8.1</u>	2.0	1.1	<u>12.0</u>	3.9	3.3	6.9
7	2.1	0.1	0.2	3.9	0.4	0.8	1.4
8	1.3	0.3	0.1	2.5	0.8	0.4	0.7
9	0.6	0.2	<0.1	1.5	0.5	0.4	0.5
10	0.6	<0.1	<0.1	1.1	0.2	0.2	0.4
11	1.1	0.2	0.1	2.0	0.4	0.4	0.9
Controls	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2

^a Sites on company property

^b Values exceeding the Ontario air quality objective of $7.0 \text{ g}/\text{m}^2/30$ days are underlined.

TABLE 3. Correlation matrix of selected parameters in snow meltwater and the distance from Proboard Ltd., Atikokan, February, 1988.

	PTC ^a	RST ^b	RSF ^c	RSP ^d	Cond.
pH					
RST ^b	.94*				
RSF ^c	.86*	.98*			
RSP ^d	.98*	.98*	.91*		
Conductivity	.66*	.72*	.64*	.77*	
pH	.74*	.77*	.68*	.82*	.99*
Dist. ^e	-.80*	-.66*	-.59*	-.69*	-.60* -.62*

*denotes a significant Pearson correlation at the 95% confidence interval.

^a PTC = total particulate carbon

^b RST = total solids

^c RSF = dissolved solids

^d RSP = suspended solids

^e Dist. = distance from sampling sites to centre of Proboard Ltd. building.

TABLE 4. Total and insoluble dustfall ($\text{g}/\text{m}^2/30$ days) near Proboard Ltd., Atikokan, October, 1987 to March, 1988.

Station ^a	1987			1988			Mean
	Oct	Nov	Dec	Jan	Feb	Mar	
Total dustfall							
62064	2.1	1.0	1.6	1.6	1.1	3.0	1.7
62065	2.4	1.0	5.8	1.2	1.0	1.6	2.2
62066	3.5	4.1	2.0	0.6	0.8	3.1	2.4
62067	5.3	5.2	2.7	1.4	0.6	1.8	2.8
Insoluble dustfall							
62064	1.0	0.8		1.1	0.5	1.8	1.0
62065	1.4	1.0	2.5	0.7	0.5	0.8	1.2
62066	0.7	3.5	1.3	0.2	0.3	1.7	1.3
62067	4.1	4.2	2.0	0.9	0.2	1.1	2.1

^a See Figure 2.

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